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Date: March 22, 2002

To: Brent Ogden

From: Manuel Padron

Subject: Bay Crossing Study – Operating Statistics and O&M Cost Estimates

This memo presents estimates of annual operating statistics and O&M cost estimates for the BART alternatives being considered in the Bay Crossing Study.

Operating Statistics

Operating statistics were estimated with a model developed by MPA and calibrated to actual FY 2001 BART statistics. The existing (FY2001) BART service is in Table 1, for reference. The future operating plans assume the BART extension to San Jose and service to SFO/Millbrae. All operating plans assume a basic 12-minute peak and midday headway on each route (Red, Blue, Green, etc.) with supplemental service (i.e., rush hour trains) added where needed. The 12-minute headway is consistent with current BART service patterns and with long-range service assumptions in the MTC travel demand model. Operating plan assumptions and associated statistics are as follows:

Baseline Alternative

This alternative assumes 27 trains/hour through the existing trans-bay tube in the peak hour. The operating plan for this alternative assumes 12-minute headways on the four routes crossing the Bay (i.e., a combined service of 20 trains/hour), with an additional 7 trains/hour on the West Pittsburgh line. Since we only have a single, combined peak hour line load through the existing tube, we could not tailor service to the demand on each route. The combined peak hour, peak direction line load forecast through the existing tube is approximately 33,300. However, the maximum available capacity with 10-car trains on all 27 trains in the peak hour is 24,300 (67 seats/car and a 1.35 load standard, or a capacity of approximately 90 passengers per car). Therefore, we are well short of meeting the projected demand. We assumed 10-car trains in the peak hour and peak period shoulders for all routes crossing the Bay. We also had to assume train consists for the San Jose-Richmond line in the peak period (7-car trains), and for the midday and weekend periods on all lines. Again, we made these assumptions because we do not have ridership forecasts for each individual route.

Table 2 presents the operating statistics for the Baseline Alternative, using the train consist assumptions mentioned above. The Baseline Alternative requires 896 cars, including spares.

Alternative 1

This alternative assumes 30 trains/hour through the existing tube in the peak hour. The operating plan assumes 12-minute headways on the four lines crossing the Bay (i.e., 20 trains/hour), with an additional 9 trains/hour from the West Pittsburgh line plus one train/hour from Fremont. Again, we could not address the demand of each route individually because we only have the combined peak hour load of all routes across the Bay. The combined peak hour, peak direction line load forecast through the existing tube is approximately 32,400 (which, curiously is less than in the Baseline Alternative). However, the maximum available capacity with 10-car trains on all 30 trains in the peak hour is 27,000 (67 seats/car and a 1.35 load standard, or a capacity of approximately 90 per car). Again, we are well short of meeting the projected demand. We assumed 10-car trains in the peak hour and peak shoulders for all routes crossing the Bay. Without ridership forecasts by route, we also had to assume train consists for the San Jose-Richmond line, and for the midday and weekend periods on all routes.

Table 3 presents rail operating plan statistics for Alternative 1, using the train consist assumptions described above. Alternative 1 requires 943 cars in the fleet, including spares (47 cars more than the Baseline Alternative).

Alternative 2

This alternative assumes a second Transbay Tube with service to Union Square. This alternative was modeled with 60 trains/hour crossing through both tubes (30 trains per hour through each). However, the line loads obtained indicate that this level of service *is not warranted*. Therefore, we revised the operating plan for this alternative with 45 trains/hour through both tubes. This plan assumes 12-minute service for each of the five routes through the existing tube, resulting in 25 trains/hour (10 trains/hour from Pittsburgh, 5 trains/hour from Richmond, 5 trains/hour from San Jose and 5 trains/hour from East Dublin). Another twenty (20) trains per hour would cross through the proposed new tube (5 trains/hour from Richmond, 5 trains/hour from Pittsburgh, 5 trains/hour from East Dublin and 5 trains/hour from Fremont). Ten-car trains are required for routes through the existing tube. Eight-car trains (average) are required for routes through the new tube. The combined capacity through both tubes with this operating plan would be 36,900, somewhat higher than the predicted combined peak hour line load of 33,100. Thus, this operating plan provides sufficient capacity to meet demand. As previously noted, we had to assume train consists for the San Jose-Richmond line, and for the midday and weekend periods on all lines since we do not have ridership data for each separate route.

Table 4 presents rail operating plan statistics for Alternative 3, using the train consist assumptions mentioned above. Alternative 2 requires 1,213 cars in the fleet, including spares (317 cars more than the Baseline Alternative).

O&M Costs

The statistics generated from the operating plans were used to estimate annual operating and maintenance costs, with the BART O&M cost model. This model was developed by MPA with FY 2001 cost data, and recently updated for the Silicon Valley Rapid Transit Corridor. The worksheets at the end of this memo include a list of input data. Projected system ridership for the Baseline and Alternative 1 were *scaled down* in the cost model to reflect the capacity constraints of the Baseline and Alternative 1. The incremental annual cost of each alternative, in constant, 2001 dollars) over the Baseline Alternative is as follows:

Alternative 1 = \$5.1 million / year.

Alternative 2 = \$102.8 million / year.

Because of the many assumptions we made, the O&M cost estimates presented in this memo should be regarded as “order-of-magnitude.” A more refined analysis of line load forecasts and train capacity requirements would be required should this project advance further.

C:\BART XO\O&M Cost Results

TABLE 1:
BART EXISTING RAIL OPERATING PLAN
Based on July 2001 Schedules

From	To	Run Time	Distance (miles)	Day	Headway					Consist					Vehicles		Annual Revenue			Trains				
					Early	Peak	Shdr.	Base	Eve.	Early	Peak	Shdr.	Base	Eve.	Peak	Total	Car-Miles	Train-Hrs	Car-Hrs	Early	Peak	Shdr.	Base	Eve.
Colma	Richmond	58.0	29.2	M-F	15.0	15.0	15.0	15.0	n/a	8.0	9.7	9.7	5.0	n/a	87	104	6,106,000	32,130	235,240	9	9	9	9	0
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	n/a	5.0	n/a			456,000	3,640	18,200	0	0	0	7	0	
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0	
Colma	Pittsburgh	74.0	44.8	M-F	15.0	15.0	15.0	15.0	20.0	8.2	10.0	10.0	7.5	7.5	110	132	14,659,000	53,680	449,920	11	11	11	11	8
				Sat	20.0	n/a	n/a	20.0	20.0	7.5	n/a	n/a	10.0	5.0			2,132,000	7,900	63,440	8	0	0	8	8
				Sun	20.0	n/a	n/a	20.0	20.0	7.5	n/a	n/a	10.0	5.0			2,066,000	7,420	61,480	8	0	0	8	8
Colma (Rush Trains - O-D's Vary)	Pittsburgh	74.0	44.8	M-F	n/a	10.0	20.0	n/a	n/a	n/a	10.0	10.0	n/a	n/a	90	108	2,742,000	4,850	45,900	0	9	5	0	0
Daly City	Fremont	64.0	38.7	M-F	15.0	15.0	15.0	15.0	n/a	8.2	9.3	9.3	4.8	n/a	84	101	7,847,000	32,130	228,100	9	9	9	9	0
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	n/a	4.0	n/a			483,000	3,640	14,560	0	0	0	7	0	
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0		
Daly City	E. Dublin	61.0	39.0	M-F	15.0	15.0	15.0	15.0	20.0	7.2	8.1	8.1	4.0	6.4	73	88	9,198,000	44,500	265,320	9	9	9	9	7
				Sat	20.0	n/a	n/a	20.0	20.0	4.0	n/a	n/a	4.0	4.0			925,000	6,920	27,660	7	0	0	7	7
				Sun	20.0	n/a	n/a	20.0	20.0	4.0	n/a	n/a	4.0	4.0			869,000	6,500	25,980	7	0	0	7	7
Fremont	Richmond	62.0	36.1	M-F	15.0	15.0	15.0	15.0	20.0	4.5	6.3	6.3	3.0	4.1	63	76	6,187,000	49,730	214,250	10	10	10	10	8
				Sat	20.0	n/a	n/a	20.0	20.0	4.5	n/a	n/a	4.5	4.5			963,000	7,900	35,570	8	0	0	8	8
				Sun	20.0	n/a	n/a	20.0	20.0	4.6	n/a	n/a	4.6	4.6			930,000	7,420	34,340	8	0	0	8	8
ESTIMATED TOTALS:															507	609	55,563,000	268,360	1,719,960	48	57	53	48	23
5% for Special Events															n/a	n/a	2,778,150	13,418	85,998					
GRAND TOTALS															507	609	58,341,150	281,778	1,805,958					
Total Car-Miles =															60,091,385		(3% on top of Rev. Car-Miles)							
Total Train-Hours =															295,867		(5% on top of Rev. Train-Hours)							
Total Car-Hours =															1,896,256		(5% on top of Rev. Car-Hours)							

TABLE 2:
BART RAIL OPERATING PLAN
Baseline Alternative:
27 Trains/Hr. Through Tube

From	To	Run Time	Distance (miles)	Day	Headway					Consist					Vehicles		Annual Revenue			Trains					
					Early	Peak	Shdr.	Base	Eve.	Early	Peak	Shdr.	Base	Eve.	Peak	Total	Car-Miles	Train-Hrs	Car-Hrs	Early	Peak	Shdr.	Base	Eve.	
Richmond	Daly City	54.0	27.6	M-F	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	100	115	8,481,000	35,700	307,280	10	10	10	10	0	
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	7.0	n/a			603,000	3,120	21,840	0	0	0	6	0			
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0			
Pittsburgh	Millbrae	85.0	52.1	M-F	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	10.0	160	184	24,578,000	75,990	754,800	16	16	16	16	10		
				Sat	20.0	n/a	n/a	20.0	20.0	10.0	n/a	n/a	10.0	7.0			2,796,000	9,880	89,440	10	0	0	10	10	
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	10.0	7.0			2,139,000	7,540	68,440	0	0	0	10	10		
Rush Trains																									
Pittsburgh	Daly City	70.0	43.2	M-F	n/a	2 trips	n/a	n/a	n/a	n/a	10.0	n/a	n/a	n/a	20	23	441,000	0	7,740	0	2	0	0	0	
Pleas. Hill	Montg.	38.0	24.6	M-F	n/a	12.0	12.0	n/a	n/a	n/a	10.0	10.0	n/a	n/a	70	81	3,764,000	10,710	107,100	0	7	7	0	0	
San Jose	24th	87.0	55.4	M-F	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	160	184	17,023,000	57,120	491,640	16	16	16	16	0	
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	7.0	n/a			1,210,000	5,200	36,400	0	0	0	10	0			
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0			
E. Dublin	SFO	76.0	47.0	M-F	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	7.0	7.0	140	161	18,217,000	66,810	542,640	14	14	14	14	9	
				Sat	20.0	n/a	n/a	20.0	20.0	7.0	n/a	n/a	7.0	7.0			1,950,000	8,890	62,240	9	0	0	9	9	
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	7.0	7.0			1,488,000	6,790	47,500	0	0	0	9	9	
San Jose	Richmond	94.0	57.4	M-F	12.0	12.0	12.0	12.0	20.0	7.0	7.0	7.0	5.0	5.0	126	145	15,735,000	85,170	493,430	18	18	18	18	11	
				Sat	20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,433,000	10,870	45,760	11	0	0	11	11	
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,298,000	8,290	41,470	0	0	0	11	11	
SFO	Millbrae	4.0	1.4	M-F	12.0	12.0	12.0	12.0	20.0	3.0	3.0	3.0	3.0	3.0	3	3	198,000	5,230	14,150	1	1	1	1	1	
				Sat	20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			21,000	990	2,500	1	0	0	1	1	
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			19,000	750	2,260	0	0	0	1	1	
Ready Reserve Cars:															42										
ESTIMATED TOTALS:															821		896	101,394,000	399,050	3,136,630	75	84	82	75	31
5% for Special Events															n/a		n/a	5,069,700	19,953	156,832					
5% for Contingency															n/a		n/a	5,069,700	19,953	156,832					
GRAND TOTALS															821		896	111,533,400	438,955	3,450,293					

Total Car-Miles = 114,879,402 (3% on top of Rev. Car-Miles)
Total Train-Hours = 460,903 (5% on top of Rev. Train-Hours)
Total Car-Hours = 3,622,808 (5% on top of Rev. Car-Hours)

**TABLE 3:
BART RAIL OPERATING PLAN
Alternative 1:
30 Trains/Hr. Through Tube**

From	To	Run Time	Distance (miles)	Day	Headway					Consist					Vehicles		Annual Revenue			Trains											
					Early	Peak	Shdr.	Base	Eve.	Early	Peak	Shdr.	Base	Eve.	Peak	Total	Car-Miles	Train-Hrs	Car-Hrs	Early	Peak	Shdr.	Base	Eve.							
Richmond	Daly City	54.0	27.6	M-F	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	100	115	8,481,000	35,700	307,280	10	10	10	10	0							
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	n/a	n/a	7.0	n/a			603,000	3,120	21,840	0	0	0	6	0							
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0							
Pittsburgh	Millbrae	85.0	52.1	M-F	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	10.0	10.0	160	184	24,578,000	75,990	754,800	16	16	16	16	10							
				Sat	20.0	n/a	n/a	20.0	20.0	10.0	n/a	n/a	10.0	7.0			2,796,000	9,880	89,440	10	0	0	10	10							
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	10.0	7.0			2,139,000	7,540	68,440	0	0	0	10	10							
Rush Trains																															
Pittsburgh	Daly City	70.0	43.2	M-F	n/a	3 trips	n/a	n/a	n/a	n/a	10.0	n/a	n/a	n/a	30	35	661,000	0	11,600	0	3	0	0	0							
Pleas. Hill	Daly City	54.0	32.1	M-F	n/a	1 trip	n/a	n/a	n/a	n/a	10.0	n/a	n/a	n/a	10	12	164,000	0	3,190	0	1	0	0	0							
Pleas. Hill	Montg.	38.0	24.6	M-F	n/a	12.0	12.0	n/a	n/a	n/a	10.0	10.0	n/a	n/a	70	81	3,764,000	10,710	107,100	0	7	7	0	0							
San Jose	24th	87.0	55.4	M-F	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	160	184	17,023,000	57,120	491,640	16	16	16	16	0							
				Sat	n/a	n/a	n/a	20.0	n/a	n/a	n/a	n/a	7.0	n/a			1,210,000	5,200	36,400	0	0	0	10	0							
				Sun	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0							
Rush Trains																															
Fremont	24th	54.0	34.1	M-F	n/a	60.0	60.0	n/a	n/a	n/a	10.0	10.0	n/a	n/a	20	23	1,043,000	3,060	30,600	0	2	2	0	0							
E. Dublin	SFO	76.0	47.0	M-F	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	7.0	7.0	140	161	18,217,000	66,810	542,640	14	14	14	14	9							
				Sat	20.0	n/a	n/a	20.0	20.0	7.0	n/a	n/a	7.0	7.0			1,950,000	8,890	62,240	9	0	0	9	9							
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	7.0	7.0			1,488,000	6,790	47,500	0	0	0	9	9							
San Jose	Richmond	94.0	57.4	M-F	12.0	12.0	12.0	12.0	20.0	7.0	7.0	7.0	5.0	5.0	126	145	15,735,000	85,170	493,430	18	18	18	18	11							
				Sat	20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,433,000	10,870	45,760	11	0	0	11	11							
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,298,000	8,290	41,470	0	0	0	11	11							
SFO	Millbrae	4.0	1.4	M-F	12.0	12.0	12.0	12.0	20.0	3.0	3.0	3.0	3.0	3.0	3	3	198,000	5,230	14,150	1	1	1	1	1							
				Sat	20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			21,000	990	2,500	1	0	0	1	1							
				Sun	n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			19,000	750	2,260	0	0	0	1	1							
Ready Reserve Cars (Assume same req't. as Baseline):															42																
ESTIMATED TOTALS:															861	943	102,821,000	402,110	3,174,280	75	88	84	75	31							
5% for Special Events															n/a	n/a	5,141,050	20,106	158,714												
5% for Contingency															n/a	n/a	5,141,050	20,106	158,714												
GRAND TOTALS															861	943	113,103,100	442,321	3,491,708												

Total Car-Miles = 116,496,193 (3% on top of Rev. Car-Miles)
Total Train-Hours = 464,437 (5% on top of Rev. Train-Hours)
Total Car-Hours = 3,666,293 (5% on top of Rev. Car-Hours)

TABLE 4:
BART RAIL OPERATING PLAN
Alternative 3:
Second Transbay Tube (45 Trains/Hr. Through Two Tubes)

From		To		Run Time	Distance (miles)	Day	Headway					Consist					Vehicles		Annual Revenue			Trains									
							Early	Peak	Shdr.	Base	Eve.	Early	Peak	Shdr.	Base	Eve.	Peak	Total	Car-Miles	Train-Hrs	Car-Hrs	Early	Peak	Shdr.	Base	Eve.					
Richmond	Daly City	54.0	27.6	M-F Sat Sun	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	100	115	8,481,000	35,700	307,280	10	10	10	10	0							
					n/a	n/a	n/a	20.0	n/a	n/a	n/a	7.0	n/a			603,000	3,120	21,840	0	0	0	6	0								
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
Richmond	Union Sq.	38.0	21.1	M-F Sat Sun	12.0	12.0	12.0	12.0	n/a	8.0	8.0	8.0	7.0	n/a	56	64	5,676,000	24,990	188,320	7	7	7	7	0							
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
Pittsburgh	Millbrae	85.0	52.1	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	10.0	160	184	24,578,000	75,990	754,800	16	16	16	16	10								
					20.0	n/a	n/a	20.0	20.0	10.0	n/a	n/a	10.0	7.0			2,796,000	9,880	89,440	10	0	0	10	10							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	10.0	7.0			2,139,000	7,540	68,440	0	0	0	10	10								
Pittsburgh	Union Sq.	55.0	38.5	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	8.0	8.0	8.0	10.0	10.0	88	101	16,690,000	52,400	476,850	11	11	11	11	7							
					20.0	n/a	n/a	20.0	20.0	7.0	n/a	n/a	7.0	7.0			1,598,000	6,920	48,410	7	0	0	7	7							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	7.0	7.0			1,219,000	5,280	36,950	0	0	0	7	7								
Rush Trains																															
Pleas. Hill	Montg.	38.0	24.6	M-F	n/a	12.0	12.0	n/a	n/a	n/a	10.0	10.0	n/a	n/a	70	81	3,764,000	10,710	107,100	0	7	7	0	0							
San Jose	24th	87.0	55.4	M-F Sat Sun	12.0	12.0	12.0	12.0	n/a	10.0	10.0	10.0	7.0	n/a	160	184	17,023,000	57,120	491,640	16	16	16	16	0							
					n/a	n/a	n/a	20.0	n/a	n/a	n/a	7.0	n/a			1,210,000	5,200	36,400	0	0	0	10	0								
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
Fremont	Union Sq.	49.0	32.8	M-F Sat Sun	12.0	12.0	12.0	12.0	n/a	8.0	8.0	8.0	7.0	n/a	80	92	8,824,000	35,700	269,030	10	10	10	10	0							
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a			0	0	0	0	0	0	0	0								
E. Dublin	SFO	76.0	47.0	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	10.0	10.0	10.0	7.0	7.0	140	161	18,217,000	66,810	542,640	14	14	14	14	9							
					20.0	n/a	n/a	20.0	20.0	7.0	n/a	n/a	7.0	7.0			1,950,000	8,890	62,240	9	0	0	9	9							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	7.0	7.0			1,488,000	6,790	47,500	0	0	0	9	9							
E. Dublin	Union Sq.	45.0	32.5	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	8.0	8.0	8.0	7.0	7.0	72	83	11,354,000	43,220	314,420	9	9	9	9	6							
					20.0	n/a	n/a	20.0	20.0	7.0	n/a	n/a	7.0	7.0			1,349,000	5,930	41,500	6	0	0	6	6							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	7.0	7.0			1,029,000	4,520	31,670	0	0	0	6	6							
San Jose	Richmond	94.0	57.4	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	7.0	7.0	7.0	5.0	5.0	126	145	15,735,000	85,170	493,430	18	18	18	18	11							
					20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,433,000	10,870	45,760	11	0	0	11	11							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	5.0	5.0			1,298,000	8,290	41,470	0	0	0	11	11							
SFO	Millbrae	4.0	1.4	M-F Sat Sun	12.0	12.0	12.0	12.0	20.0	3.0	3.0	3.0	3.0	3.0	3	3	198,000	5,230	14,150	1	1	1	1	1							
					20.0	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			21,000	990	2,500	1	0	0	1	1							
					n/a	n/a	n/a	20.0	20.0	n/a	n/a	n/a	3.0	3.0			19,000	750	2,260	0	0	0	1	1							
Ready Reserve Cars (assume 20 additional cars over Baseline):															62																
ESTIMATED TOTALS:															1,117	1,213	148,692,000	578,010	4,536,040	112	119	119	112	44							
5% for Special Events															n/a	n/a	7,434,600	28,901	226,802												
5% for Contingency															n/a	n/a	7,434,600	28,901	226,802												
GRAND TOTALS															1,117	1,213	163,561,200	635,811	4,989,644												

Total Car-Miles = 168,468,036 (3% on top of Rev. Car-Miles)
Total Train-Hours = 667,602 (5% on top of Rev. Train-Hours)
Total Car-Hours = 5,239,126 (5% on top of Rev. Car-Hours)

27 Trains/Hr.

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3/22/02

BART XO - Alternative 1

30 Trains/Hr.

System Characteristic	Driving Variable	Input Value	Variable/Measure	Value/Amount														
Input Statistics:			Assumptions:															
Forecast Year	YEAR	2025	Fare Increase	0														
Linked Passenger Trips	RIDER	138.8 million	Extension	0														
Lines	LINE	5	Demand Retention	0														
Peak Vehicles	PEAKCAR	861	Maintenance	0														
Fleet Vehicles	TOTALCAR	943	CPI	0.0%														
Peak Trains	PEAKTRAIN	88																
Base Trains	BASETRAIN	75																
Early/Late Trains	ELTRAIN	31																
Total Car Miles	CARMILE	116.5 million	Performance Measures:															
Total Train Hours	TRAINHOUR	464.44 thousand	Cost per Train Hour	\$999														
Revenue Route Miles	ROUTEMILE	125	Cost per Car Mile	\$3.98														
Total Stations	STATION	53	Cost per Passenger	\$3.34														
Elevated Stations	ELEVATED	18																
At-Grade Stations	ATGRADE	15	EXPENSE SUMMARY:															
Subway Stations	SUBWAY	20	<table><tr><td>Total O&M Cost</td><td>\$464,040,792</td></tr><tr><td>Net Labor</td><td>\$336,888,679</td></tr><tr><td>Shuttle Service</td><td>\$0</td></tr><tr><td>Express Bus Service</td><td>\$2,855,476</td></tr><tr><td>ADA Service</td><td>\$0</td></tr><tr><td>Traction & Station Power</td><td>\$31,979,704</td></tr><tr><td>Other Non-Labor</td><td>\$92,316,933</td></tr></table>		Total O&M Cost	\$464,040,792	Net Labor	\$336,888,679	Shuttle Service	\$0	Express Bus Service	\$2,855,476	ADA Service	\$0	Traction & Station Power	\$31,979,704	Other Non-Labor	\$92,316,933
Total O&M Cost	\$464,040,792																	
Net Labor	\$336,888,679																	
Shuttle Service	\$0																	
Express Bus Service	\$2,855,476																	
ADA Service	\$0																	
Traction & Station Power	\$31,979,704																	
Other Non-Labor	\$92,316,933																	
Stations w/Parking Lots	PARKING	49																
Yard w/ backshops	YARDwBS	2																
Service & Inspection Yards	YARD	5																
Growth & Inflation (annual average):																		
Labor:																		
Labor Wage & Fringe Benefits	WAGEFAC	0.0%																
Non-Labor:																		
CC Material	CCMATLFAC	0.0%	Calibration System-FY 2001 Budget \$327,002,848															
CC Services	CCSERVFAC	0.0%	Incremental Cost of Case \$137,037,944															
CC Travel & Miscellaneous	CCMISCFAC	0.0%																
CC Insurance	CCINSFAC	0.0%	EMPLOYEE SUMMARY:															
DP Material	DPMATLFAC	0.0%	Total Headcount 4,799.2															
DP Miscellaneous	DPMISCFAC	0.0%	Operating 4,463.2															
DP Utilities	DPUTILFAC	0.0%	Capital 336.0															
DP Purchased Transportation	DPPTFAC	0.0%																
DP Bus Program	DPBUSFAC	0.0%																

Prepared by Manuel Padron & Associates
3/22/02

BART XO - Alternative 2

45 Trains/Hr.

System Characteristic	Driving Variable	Input Value	Variable/Measure	Value/Amount														
Input Statistics:			Assumptions:															
Forecast Year	YEAR	2025	Fare Increase	0														
Linked Passenger Trips	RIDER	162.7 million	Extension	0														
Lines	LINE	5	Demand Retention	0														
Peak Vehicles	PEAKCAR	1,117	Maintenance	0														
Fleet Vehicles	TOTALCAR	1,213	CPI	0.0%														
Peak Trains	PEAKTRAIN	119																
Base Trains	BASETRAIN	112																
Early/Late Trains	ELTRAIN	44																
Total Car Miles	CARMILE	168.5 million	Performance Measures:															
Total Train Hours	TRAINHOUR	667.60 thousand	Cost per Train Hour	\$841														
Revenue Route Miles	ROUTEMILE	134	Cost per Car Mile	\$3.33														
Total Stations	STATION	57	Cost per Passenger	\$3.45														
Elevated Stations	ELEVATED	18																
At-Grade Stations	ATGRADE	15	EXPENSE SUMMARY:															
Subway Stations	SUBWAY	24	<table><tr><td>Total O&M Cost</td><td>\$561,779,799</td></tr><tr><td>Net Labor</td><td>\$406,070,046</td></tr><tr><td>Shuttle Service</td><td>\$0</td></tr><tr><td>Express Bus Service</td><td>\$2,855,476</td></tr><tr><td>ADA Service</td><td>\$0</td></tr><tr><td>Traction & Station Power</td><td>\$44,547,832</td></tr><tr><td>Other Non-Labor</td><td>\$108,306,446</td></tr></table>		Total O&M Cost	\$561,779,799	Net Labor	\$406,070,046	Shuttle Service	\$0	Express Bus Service	\$2,855,476	ADA Service	\$0	Traction & Station Power	\$44,547,832	Other Non-Labor	\$108,306,446
Total O&M Cost	\$561,779,799																	
Net Labor	\$406,070,046																	
Shuttle Service	\$0																	
Express Bus Service	\$2,855,476																	
ADA Service	\$0																	
Traction & Station Power	\$44,547,832																	
Other Non-Labor	\$108,306,446																	
Stations w/Parking Lots	PARKING	49																
Yard w/ backshops	YARDwBS	2																
Service & Inspection Yards	YARD	6																
Growth & Inflation (annual average):																		
Labor:																		
Labor Wage & Fringe Benefits	WAGEFAC	0.0%																
Non-Labor:																		
CC Material	CCMATLFAC	0.0%	Calibration System-FY 2001 Budget \$327,002,848															
CC Services	CCSERVFAC	0.0%	Incremental Cost of Case \$234,776,951															
CC Travel & Miscellaneous	CCMISCFAC	0.0%																
CC Insurance	CCINSFAC	0.0%	EMPLOYEE SUMMARY:															
DP Material	DPMATLFAC	0.0%	Total Headcount 5,714.4															
DP Miscellaneous	DPMISCFAC	0.0%	Operating	5,378.4														
DP Utilities	DPUTILFAC	0.0%	Capital	336.0														
DP Purchased Transportation	DPPTFAC	0.0%																
DP Bus Program	DPBUSFAC	0.0%																

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3/22/02